DOCUMENT RESUME

ED 244 567 HE 017 270

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TITLE Computerizing the Budget Office: An On-Line Decision Support System.
PUB DATE Dec 83
NOTE 12p.; In: Information Resources and the Individual. Proceedings of the CAUSE National Conference (San Francisco, CA, December 11-14, 1983). Boulder, CO, CAUSE, 1984, p. 359-369. For the complete proceedings, see HE 017 245.
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Budgeting; *College Administration; *Computer Oriented Programs; Decision Making; Educational Finance; Higher Education; *Management Information Systems; *Online Systems; Resource Allocation
IDENTIFIERS *Decision Support Systems; *University of Connecticut

ABSTRACT

The implementation process and resource requirements of the University of Connecticut Budget Office's online decision support system are described. Successes and failures of shifting to a fully interactive budget review and development process are also reviewed. Special attention is given to the personnel problems and analytical challenges encountered in the evolution to computerization. Examples are cited of financial models and graphics used to facilitate meeting information requests, perform complex revenue and expenditure analyses, and prepare the budget request. The university's Budgetary Decision Support System (BUDDS) consists of the following key data files: summary expenditure information, personnel information, budgeted position control, budget requests and allotments, and budgetary expenditure accounts. The University of Connecticut's budget development system and the interactive budgetary development model are discussed, along with the marketing of the budget. Attention is also given to the report generator, FOCUS, which enables the budget office to tabulate budgetary information. It is noted that reports generated from three FOCUS files enable administrators to monitor budgetary commitments and assure that allocations are obeyed. FOCUS also contains a facility that simplifies the creation of complicaed financial models. (SW)

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COMPUTERIZING THE BUDGET OFFICE:
An On-Line Decision Support System

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The University of Connecticut Budget Office has created a fully on-line decision support system using the school's existing information system to provide management with instant and unique views of the financial data base. The highly versatile language FOCUS is used to interactively access the data without programming assistance from the Computer Center's staff. The paper recounts the implementation process and resource requirements, describes the attributes of the system and evaluates the successes and failures of shifting to a fully interactive budget review and development process. Special attention is given to the personnel problems and analytical challenges encountered in the evolution to computerization. Examples will be cited of financial models and graphics used to facilitate meeting internal and external information requests, perform complex revenue and expenditure analyses, and prepare multiple versions of the annual $200 million budget request.

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HE017 270

Paper presented at the
CAUSE National Conference
(San Francisco, CA, Dec. 11-14, 1983)

The University of Connecticut Budget Office has embraced computer technology to develop, market, implement, control, and analyze the school's $200 million operating budget. A comprehensive on-line decision support system, which was created without substantial improvement to the University's batch mode production information systems, is accessed by using FOCUS, a fourth generation report generator. The experiences at the University of Connecticut serve as a model for institutions that need to computerize retrieval of management information but which are unable to divert substantial resources to the development of state-of-the-art transactional processing systems.

I. ATTRIBUTES OF THE BUDGETARY DECISION SUPPORT SYSTEM

1) Technical - The Budgetary Decision Support System (BUDDS) runs on the University's interactive network which is anchored by an IBM 3081D mainframe, with on-line access using VM/CMS. The primary software is FOCUS--the report generator, University of Waterloo SCRIPT--the word processor, and XEDIT--the system editor. The budget staff also uses an IBM Personal Computer linked to the mainframe via Asynchronous RS232 communications and the B3101 terminal emulator. The PC is used with a Hewlett Packard 7470A Graphics Plotter and CHARTMAN II graphics software to produce high quality bar, pie, line and text charts.

2) The Data Base - The Budget Office accesses several primary files that are resident on the main computer system and the Office has created scores of other subsidiary files using the extraction, matching and joining capacities of FOCUS.

The key data files used in BUDDS are:

1) Summary Expenditure Information (last four years on-line),
2) Personnel Information (current data only),
3) Budgeted Position Control (last two fiscal years on-line),
4) Budget Requests and Allotments (current fiscal year), and
5) Table of Budgetary Expenditure Accounts (current codes only).

In addition, the Office has created and accesses the following files:

1) Budget Development File (merges data from the five key files),
2) Budget Request Tracking File,
3) Executive Permanent and One-Shot Allotment Tracking File,
4) Energy Usage/Price File and Projection Model,
5) Interactive Tuition Projection Model, and
6) Collective Bargaining Interactive Negotiation Model.

II. IMPLEMENTING THE BUDDS SYSTEM

Two years ago, the data needed to prepare and monitor the budget was controlled by the University's Administrative Data Processing (ADP) Group. Computerized access to the files was restricted to the professional programming staff. While the ADP Group acknowledged the user's needs for timely and accurate analysis, the computer programming staff was unable to respond to the continuous requests for unique aggregations of financial data because of higher priority projects. The limitation on direct user access meant that the Budget Office was relegated to using cumbersome detailed accounting reports to support a manual budget development and control system.

Inflationary pressures at the end of the last decade coupled with annual mid-year recisions of appropriations forced the budget staff to expand its capacity to control and identify opportunities to reallocate funds. The Budget Office needed to examine the spending patterns of departments to identify problem areas for the vice presidents and to suggest supplements to the yearly allotments. The Summary Expenditure Information file contains allotment, encumbrance and expenditure data which is required to analyze the departmental

spending patterns. The Computer Center staff proposed to assist the Budget Office by placing daily output of the current year Summary Expenditure file to disk for on-line read-only retrieval as needed. The main constraint of this proposal was the lack of on-line programming experience by the budget staff.

The initial training experiences severely deflated the enthusiasm of the budget staff. They attended presentations which were geared for students and academic users and the budget staff found many of the examples difficult to apply to administrative user problems. The intervention which saved the experiment came when the ADP staff personally assisted the budget staff by providing solutions to many technical problems.

The first special reports which were generated quickly enhanced the control function of the office. Unique aggregations of expenditure data allowed the budget managers to gain new perspectives on the allocation and disbursement of funds. Problem spending areas were identified by calculating a percentage of commitments to date against an allotment. Sorting the output simplified exception analysis and saved the staff from the time-consuming aggregation and calculation of the status of each expenditure account. The computer opened an opportunity for staff to isolate emerging budget shortages and resolve problems before they worsened. Additionally, computerized searches for strings of data enabled the office to audit the accounts far more rapidly than previously was possible.

III. MANAGING THE BUDGET PROCESS

A. Budget Development

The University of Connecticut Budget Office prepares five unique versions of the school's $200 million spending plan during an 18-month budget development

cycle. A different submission is required to conform to the budget format used by each recipient. These budget types include:

1) Board of Trustees - program budget by school or department
2) Department of Higher Education - major line item by campus
3) Office of Policy and Management - detailed minor line item by function
4) Legislative Appropriation's Committee - all of the above (as required)
5) Departmental Allotments - detailed by minor line item and function.

The data required to assemble these budget requests comes from nearly every financial and personnel data file. The Budget Office formerly requested annual printouts of the basic data that were produced in formats which had remained unaltered during the last decade. The two budget staff members charged with developing the budget calculations in each of the unique formats for submission were faced with an overwhelming annual task of aggregation.

The current budget development system is fully automated and provides more flexibility and guarantee of accuracy than its manual predecessor. FOCUS enables the budget staff to create a system which is used to analyze, model, and prepare the statements and forms that are required by each reviewing agency in final copy-ready form. Files are created by extracting the required elements from the main data base files with sufficient foresight to anticipate components needed to aggregate the data into the budget formats. The key digits enable the office to link data from distinct physical files to form a new data base.

The Office uses an interactive budgetary development model which details additions to the base and quickly provides a bottom line for all alternatives. The model consists of 1) a Request Tracking File which contains the key code and description of the detail budget request and, 2) a spreadsheet which compares current year and requested year amounts by major line item and

program. These two files enable the vice presidents to finely hone alternative requests and immediately view the impact on the bottom line. Revenue required to fund the budget is projected using an interactive Tuition Projection Model. This model allows the alteration of enrollment assumptions and provides for the calculation of differential tuition rates along the dimensions of residency status, level of instruction, and school.

Calculation of the University's personnel budget is complicated by the presence of 11 different bargaining units on the campus representing 4400 employees. The Office of Policy and Management--the Governor's budget office--requires detailed calculation of the budget request by bargaining unit in addition to the detailed line item and functional submission because it must prepare a centralized request to the Legislature for funding of unsettled contracts. Extreme accuracy is required since a small calculation error could have enormous impact on the General Fund personal services appropriation which exceeds $80 million. FOCUS is used to match the Personnel Information File with the Budgeted Position Control File to create an extracted file containing the account code, bargaining unit identifier and personnel classification data by individual employee. This file is run against an algorithm which determines the impact of the 11 contractual settlements along each of the dimensions of the budget submission.

The computer is also used to prepare the final copy of all budget presentations. The Board of Trustees program budget contains two pages for each school or division. The first page includes detailed descriptions, activity level data, and output indicators. The Office of Institutional Research maintains the data base needed to update this material and uses the University's word processing software, SCRIPT, to create this report. The top

half of the facing page contains the budget request detail by source of funds and major expenditure line item. The lower half of the second page contains a personnel matrix which summarizes the position allocations by fund source and type of position. The second page of each departmental request is prepared using the FOCUS financial modelling language and is printed in final form. The development of the files and programs used to generate the budget document allows the Budget Office an additional month to prepare the Board of Trustees Program Budget. This extension offers the University's top management a chance to more effectively evaluate the proposals which it submits to the governing board.

B. MARKETING THE BUDGET

As a public institution, the University annually presents its budget to four governmental units charged with oversight of the school's fiscal affairs. The Budget Office works with the Vice President for Finance and Administration to assure that the University's positions are clearly articulated and understood. Computerized business graphics are incorporated with tabular reports prepared directly from the data base, to sell the "political" budget in oral and written presentations. Bar, pie, line and text charts are created to explain policy alternatives and computer generation of graphics allows the Office to test various presentations and easily alter the charts to assure maximum impact.

FOCUS enables the Office to tabulate budgetary information exactly as requested by the reviewing bodies. The Office maintains a library of special formats and a core body of software which is quickly modified to react to the unique demands. Responses are often prepared within minutes and sent to the requestor. The Office also uses the electronic transfer of files to accounts on the University network to speed delivery of information. The increased speed

and level of responsiveness has enhanced the University's credibility in the State Capitol and strengthened its bargaining power.

C. IMPLEMENTATION, CONTROL AND ANALYSIS

The most important function of the Budget Office is the allocation and control of departmental budgets. The General Fund appropriation and Tuition Fund authority is translated, each July, into line item departmental allotments. These allotments are based on historic funding levels (prior years' permanent allotments), one-shot needs, enrollment or service demand, and new program needs. FOCUS reports revealing a department's spending history from the Summary Expenditure File are combined with the Budget Request File to become the vice presidents' worksheets for determining departmental funding levels. Subsequently, allotments are directly input to the accounting system from the Budget Request File. FOCUS also is used to assure that the allotments in the Current Year Summary Expenditure File balance with those contained in the Budget Request File. Every month, the vice presidents receive a six-part report which summarizes the allotment levels within their purview. These reports, which are generated from three FOCUS files maintained by the Budget Office, enable the institution's executives to closely monitor budgetary commitments and assure that allocations are obeyed.

A menu-driven Executive Budget System eases access to the control reports within BUDDS. The dialogue manager feature within FOCUS is used to elicit responses from an analyst reviewing the budgetary accounts. Budgets may be viewed from several directions. Normally an exception analysis is run by major object of expenditure to determine if overall spending is within the allotment limits. Excessive or insufficient spending patterns are highlighted by ordering the report by percentage-spent-to-date. A second inquiry direction

allows the analyst to view detailed allotments and commitments by department. This helps the Office to quickly isolate problem areas without poring through hundreds of pages of expenditure detail.

The on-line Summary Expenditure File contains information which is current through the last scheduled update. On-line access enables the Budget Office to extract information from the accounting system up to seven weeks earlier than previously possible. Detailed transactions are available only through hard-copy reports since the disk storage requirement is excessive and is not cost justified. The on-line output helps the Office provide reliable, timely control information to University managers. Access to the Current Year Summary Expenditure File will soon be available to all departmental managers with terminals on the network.

D. PROJECTIONS AND MODELS

FOCUS contains a facility which simplifies the creation of complicated financial models. The Budget Office generates models to project the impact of alternative collective bargaining settlements, tuition levels and enrollment patterns, and energy consumption and price changes. The modelling language allows the Office to precisely tailor output in print-ready form including the insertion of standard accounting statement conventions.

The Collective Bargaining Interactive Negotiation Model was developed during the past round of negotiations with the professional employees union. Within seconds after a settlement is proposed, the financial impact of a package is determined. The model's variables, including salary percentage increases, annual increments, and merit pools are projected for the length of the contract. The printed report contains a calculation of the actual and

annualized cost and percentage increase for each year. The development of the model encouraged management and union representatives to move the site of the bargaining table to an office with a terminal and a high speed printer. During the final financial negotiations, the model was used to generate a dozen proposals and tentative agreement was quickly reached.

The Interactive Tuition Projection Model forecasts the revenue impact of changes in enrollment at each of the University's six campuses within three categories of residency and three levels of educational program. The tuition rate and enrollment level are altered to produce a projection of a tuition increase by campus, residency and level. The model summarizes the total income and the percentage increase of the changes.

The Energy Projection Model forecasts the current year and succeeding year budgets by analyzing year-to-date cost and average consumption rates from previous years. Current year actual price and usage data is combined with prior years' consumption data for subsequent months by fuel type and campus. Prices are projected by multiplying the current rate by a percentage increase or decrease during the succeeding months. The data used in the model is displayed on a line chart using the FOCUS graphics capability. Over the past three years, the Budget Office has projected the cost of energy within .5% of the annual $10 million budget by December 30.

IV. SUMMARY

The University of Connecticut succeeded in its experiment allowing direct data access by the Budget Office because of the following reasons:

1) There was an institutional commitment to purchase the proper hardware and software tools.

a) Excellent report generation software was provided - FOCUS is an extremely versatile and user-friendly language.

b) The University administration supported the upgrade of computer hardware and software as a high priority.

2) The on-line filer met nearly all of the Office's information needs and were used to perform most of the budget functions.

a) The budget staff was motivated by the ease of data access and aggregation within a short time after implementation.

3) Personal intervention during training was provided by sensitive and knowledgeable professionals.

a) The staff of the Administrative Data Processing Group personally trained the core Budget Office staff to use the on-line tools and provided encouragement at the bleakest hours.

b) The Budget Director insisted that staff use the computerized tools, led the conversion by example and continuously mollified recalcitrants by suggesting and/or programming new applications.

4) The staff achieved a high level of personal gratification and university recognition for being at the leading edge of office technology.

5) Terminals were placed at the work station of each analyst to increase ease of access and raise perceived peer prestige.

The experience at The University of Connecticut can easily be replicated at other institutions. The direct access to information will improve management decision making and justifies the marginal costs of acquiring a quality report generator, investing in hardware, and training user staff.